

REMARKS

Claims 1-7 and 9-26 are in the application and under prosecution.

By way of this communication applicants have amended the claims by incorporating the limitation of claim 8 into claim 1.

Claims 1-15 and 18-26 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as being obvious over Harrison et al.

Examiner's Position

It is the Examiner's position that Harrison et al. teaches a process wherein a hydrocarbon feedstock is passed through two or more hydrodesulfurization zones connected in a series, each containing a packed bed of solid catalyst wherein the liquid is passed from a first zone to the next until the final zone. The Examiner further mentions: make-up hydrogen being supplied to the hydrodesulfurization zone other than the first zone; hydrogen-containing gas being recovered from a subsequent hydrodesulfurization zone; target sulfur levels, etc. The Examiner believes that Harrison et al. teaches a process and composition that reasonably appears to be either the same or an obvious variation of the instantly claimed product and composition.

Applicants' Position

It is applicants' position that Harrison et al. teaches a staged hydrotreating process wherein relatively high hydrogen-containing treat gas rates are required. The claims, as now amended, require a very low treat gas rate such that the moles of hydrogen per mole of chemical hydrogen consumption be less than 3. This is not suggested by Harrison et al. For example, the moles of hydrogen required in the examples of the Harrison et al. process range from 3.7 moles of hydrogen per mole of feed for example 5 to 9.3 moles of hydrogen per mole of feed for examples

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2, 3, and 4. Harrison et al. prefers a range from about 3 to 7. The present invention is operated in such a way that very low rates of hydrogen are required compared to conventional multi-stage hydrodesulfurization, such as that of Harrison et al.

Therefore, it is requested that the Examiner reconsider and withdraw this rejection.

Claims 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harrison et al. in view of Haun et al.

Examiner's Position

Harrison et al. is relied on by the Examiner as above but differs from the instant claims in not teaching a countercurrent aromatics hydrogenation stage or stripping of the liquid stage prior to the aromatics stage.

Haun et al. is cited as teaching countercurrent aromatics hydrogenation and stripping of the liquid stage prior to the aromatics stage. The Examiner further states that Haun et al. teach a mineral oil conversion process that includes hydrodesulfurization and hydrogenation steps performed in separate reaction zones whereas the instantly claimed invention relates to the hydrogenation of distillate petroleum fractions to produce low sulfur content products. Desulfurization conditions employed are those customarily employed in the art for desulfurization of equivalent feedstocks and the effluent stream of the desulfurization zone is stripped with a stream of hydrogen-rich gas prior to being fed to the hydrogenation zone. The Examiner also mentions that the vapor phase stream from the hydrogenation step in Haun et al. is highly rich in hydrogen and relatively low in hydrogen sulfide and is "cascaded" to the hydrodesulfurization zone and that hydrogen-rich gas may flow countercurrent to the liquid-phase hydrocarbons through one or more reaction zones.

Applicants' Position

Harrison et al. has been discussed above wherein it was pointed out that the hydrogen treat gas rates required by the process of Harrison et al. are significantly higher than that instantly claimed.

Haun et al., which also relates to a multi-stage hydrodesulfurization process, requires that a hydrogen-rich stream from the first stage be recycled back to the first stage. This is not required in the instantly claimed invention wherein hydrogen for the first stage is cascaded from a downstream stage, primarily the final or aromatic hydrogenation stage.

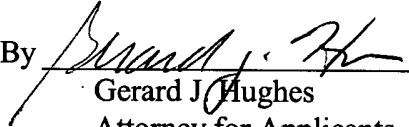
Therefore, it is requested that the Examiner also reconsider and withdraw this rejection.

Applicants' attorney notes that other art has been made of record but has not been cited against the instant claims.

In view of the above, applicant requests that the Examiner pass this application to allowance.

Respectfully submitted,

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**MARKED-UP VERSION OF AMENDED CLAIMS ACCOMPANYING RESPONSE TO
FIRST OFFICE ACTION FRO 09/553,374:**

1. (Once Amended) A multi stage process for hydrodesulfurizing and hydrogenating a distillate feedstock having a sulfur content greater than about 3,000 wppm, which process comprises:

a) reacting said feedstream in a first hydrodesulfurization stage in the presence of a hydrogen-containing treat gas, said first hydrotreating stage containing one or more reaction zones, each reaction zone operated at hydrodesulfurizing conditions and in the presence of a hydrodesulfurization catalyst, thereby resulting in a liquid product stream having a sulfur content less than about 3,000 wppm;

b) passing the liquid product stream to a first separation zone wherein a vapor phase product stream and a liquid phase product stream are produced;

c) passing the liquid phase product stream to a second hydrodesulfurization stage;

d) reacting said liquid phase product stream in said second hydrodesulfurization stage in the presence of a hydrogen-containing treat gas cascaded from, or partially cascaded from, the next downstream stage herein, **wherein the rate of introduction of the hydrogen portion of the treat gas in this second stage is less than or equal to 3 times the chemical hydrogen consumption in this second reaction stage**, said second hydrodesulfurization stage containing one or more reaction zones operated at hydrodesulfurization conditions wherein each reaction zone contains a bed of hydrotreating catalyst, thereby resulting in a liquid product stream having less than about 100 wppm sulfur;

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- e) passing the liquid product stream from said second hydrodesulfurization stage to a second separation zone wherein a vapor phase stream and a liquid phase stream are produced;
- f) collecting said vapor phase stream;
- g) passing said liquid phase stream from step e) to an aromatics hydrogenation stage; and
- h) reacting said liquid phase stream in said aromatics hydrogenation stage in the presence of a hydrogen-containing treat gas, said hydrogenation stage containing one or more reaction zones operated at aromatics hydrogenation conditions wherein each reaction zone contains a bed of aromatics hydrogenation catalyst, thereby resulting in a liquid product stream having substantially reduced levels of sulfur and aromatics, and a hydrogen-containing product stream that is cascaded to an upstream hydrodesulfurization stage.

Claim 8 has been cancelled.